

Supported Discharge Teams for older people in hospital acute care hospital: a randomised controlled trial

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Abstract

Background: Supported Discharge Teams aim to help with the transition from hospital to home, whilst reducing hospital length-of-stay. Despite their obvious attraction, the evidence remains mixed, ranging from strong support for disease-specific interventions to less favourable results for generic services.

Objective: To determine whether older people referred to a Supported Discharge Team have: (i) reduced length-of-stay in hospital; (ii) reduced risk of hospital readmission; and (iii) reduced healthcare costs.

Methods: Randomised controlled trial with follow-up to 6 months; 103 older women and 80 men ($n = 183$) (mean age 79), in hospital, were randomised to receive either Supported Discharge Team or usual care. Home-based rehabilitation was delivered by trained Health Care Assistants up to four times a day, 7 days a week, under the guidance of registered nurses, allied health and geriatricians for up to 6 weeks.

Results: Participants randomised to the Supported Discharge Team spent less time in hospital during the index admission (mean 15.7 days) in comparison to usual care (mean 21.6 days) (mean difference 5.9: 95% CI 0.6, 11.3 days: $P = 0.03$) and spent less time in hospital in the 6 months following discharge home. Supported discharge group costs were calculated at mean NZ\$10,836 (SD NZ\$12,087) compared to NZ\$16,943 (SD NZ\$22,303) in usual care.

Conclusion: A Supported Discharge Team can provide an effective means of discharging older people home early from hospital and can make a cost-effective contribution to managing increasing demand for hospital beds.

Keywords: *early supported discharge teams, intermediate care, hospital capacity, readmissions to hospital, older people*

Introduction

A UK department of health report in 2016 [1] highlighted the impact of discharge delays for older people (65+ years) on acute hospital bed-days. The report estimated that 1.15 million bed-days (an increase of 31% since 2013) could be saved annually if transfers occurred in a timely fashion. Understanding and remedying this growing problem is of importance, particularly in relation to the sustainability of health services in the developed world. As numbers of older people increase, viable alternatives to hospitalisation become increasingly important, as it is simply not possible

to continue to match population growth with hospital beds. Furthermore, research highlights that hospital is not always the best location for older people. Older people experience a rapid deterioration in strength [2] and function [3] as well as increased infection risk [4] when in hospital.

The need for greater investment in rehabilitation has been recognised for some time in New Zealand [5] and internationally [6, 7]. Continuity of care between hospital and community has long been identified as important [8] and of equal significance is the need to co-ordinate, review and establish effective links [5]. Achieving safe discharge as soon as possible after the initiating illness has resolved is

important both to the patient and the acute hospital service. Identifying a means to reduce the time an older person spends in hospital and to avoid readmission is of considerable importance to all.

Supported Discharge Teams (SDT) may protect the older person from risks of hospitalisation [9–12], allowing cost-effective use of scarce resources and be preferred by older people themselves [13]. Despite the obvious attractions of such, the evidence remains mixed, ranging from strong support for disease-specific interventions such as for stroke [14, 15], to less favourable results for generic services [16, 17]. Further, it is difficult to draw conclusions from meta-analyses. The scarcity of robust SDT trials coupled to confusion around the distinct operational aspects of these services make definitive inferences problematic. It is challenging, for example to draw meaningful interpretations from a meta-analysis that combines discrete community teams with in-patient coordinated discharge roles or care planning [17–19].

Few trials have evaluated interventions that have a focus on generic needs so that, despite their age, the original work by Martin *et al.* [12] in relation to the 'Home Treatment Team' in London and the 'Discharge of Elderly from the Emergency Department' service evaluated by Caplan *et al.* [20] in Sydney are still regularly cited. Notwithstanding the difficulties in drawing definitive conclusions from the available evidence, since 2003 the UK Department of Health has advocated the establishment of SDT [21].

The population of New Zealand, like that of many other 'new world' countries, is comparatively young; the population of older people (65+) in 2016 is 14.3%, significantly lower than the UK at 18.5%. As such, the healthcare pressures, such as hospital capacity issues observed in more 'aged' countries such as the UK and Europe are only recently being experienced. This study seeks to generate new robust evidence concerning the impact of SDTs for older people with generic needs, it explicitly describes the intervention, allowing replication and has immediate applicability for growing hospital capacity issues in demographically younger countries.

Methods

We conducted a randomised controlled trial of an early SDT (START, Supported Transfer & Accelerated Rehabilitation Team) in comparison to usual care in Waikato, New Zealand. The trial is reported according to the CONSORT statement for parallel groups [22]. Older people were eligible for the study if they met the START inclusion criteria: >65 years; in hospital at time of referral and did not require ongoing acute hospital based treatment (in the judgement of the consultant geriatrician); consented to being treated at home; and agreed with the objectives set by the referring inter-disciplinary team. Further, following assessment by the referring team, the participant was considered to have potential for partial or complete recovery with suitable home rehabilitation within 6 weeks; was able to stand and transfer with 1-person

(with or without the help of a resident carer); and the participant had a recent acute illness or injury or was at a borderline level of function with an associated reduction in Activities of Daily Living (ADL) and/or Instrumental ADL (IADL) and who without input from the team was considered likely to fail to recuperate full potential of functional recovery or was likely to fail to manage satisfactorily at home despite conventional community support and therefore would be at risk of hospital readmission or institutionalisation.

Once START eligibility was confirmed, the contact details of potential participants were forwarded to the research registered physiotherapist who then contacted participants and gained written informed consent from participants or family members or legal guardians. The multi-disciplinary team had no influence on the randomisation allocation.

Recruitment occurred over 18 months and all participants entered the study between May 2012 and October 2014. The study was approved by the National Health and Disability Ethics Committee (NTX/11/09/088) and registered on the Australian New Zealand Clinical Trials Registry (ACTRN12611000982910). Initial interviews were undertaken in a quiet hospital room and subsequent interviews via telephone by a registered health professional (speech and language therapist) employed by the researchers and independent of the health services at 3 and 6 months and lasted approximately 90 min.

The primary outcome was number of days in hospital during the initial hospital episode (the index admission).

Secondary endpoints included: (i) days in hospital during the 6 months period following randomisation (readmissions); (ii) health related costs, calculated from routine hospital administrative records; and (iii) function, as ascertained using the *interRAI* Contact Assessment (*interRAI-CA*) [23]. The *interRAI-CA* assesses multiple domains of the older person and has several sub-scales. The ADL self performance scale assesses across the domains of bathing, personal hygiene, dressing lower body, locomotion and toilet use; and the Instrumental ADL Capacity scale measures meal preparation, ordinary housework, managing medications and stairs. Several other key demographic variables were collected and presented in Table 1. All have been validated [24].

The START service consists of healthcare assistants (HCA) trained to Level III on the New Zealand Qualifications Authority framework, registered nurses working at an advanced level of practice and allied health practitioners (physiotherapy and occupational therapy). Consultant geriatricians provide weekly input through case conferencing. HCAs provided up to 4 visits a day, 7 days a week following a programme of graduated reduction of inputs (See the Table in Appendix 2, Supplementary Information) and utilise functional rehabilitation principles to maximise recovery through incorporating exercises within ADL tasks, which has a growing evidence base [25, 26] (e.g. progressively increasing walking distance, sit-to-stands, lying-in-bed to standing, carrying groceries home from shops and putting away in cupboards). The model focuses on maximising independence rather than

Table 1. Demographics

Measure	Intervention (n = 97)	Control (n = 86)
	n (%)	n (%)
Gender		
Female	59 (60.8)	44 (51.2)
Male	38 (39.2)	42 (48.8)
Mean age (SD)	79.8 (7.2)	78.7 (8.2)
Ethnicity		
European not further defined	8 (8.2)	2 (2.3)
NZ European	65 (67.0)	61 (70.9)
Other European	14 (14.4)	11 (12.8)
NZ Māori	8 (8.2)	3 (3.5)
Not stated	2 (2.1)	9 (10.5)
Living arrangement		
Alone	58 (59.2)	45 (52.3)
With spouse/partner only	27 (27.6)	28 (32.6)
With spouse/partner and other(s)	3 (3.1)	0 (0)
With child (not spouse/partner)	6 (6.1)	6 (7.0)
With sibling(s)	0 (0)	1 (1.2)
With other relative(s)/whanau	2 (2.0)	0 (0)
With non-relative(s)	2 (2.0)	2 (2.3)
Missing	0 (0)	4 (6.7)
Living		
Private home/apartment/rented room	95 (96.9)	74 (86.0)
Board and care	0 (0)	2 (2.3)
Assisted living or semi-independent living	1 (1.0)	9 (10.5)
Missing	1 (1.0)	1 (1.2)
Cognitive skills for daily decision making		
Independent	84 (85.7)	70 (81.4)
Modified independent or any impairment	14 (14.3)	16 (18.6)
Comprehension (ability to understand others)		
Understands	82 (83.7)	73 (84.9)
Usually understands	13 (13.3)	11 (12.8)
Often understands	3 (3.1)	1 (1.2)
Sometimes understands	0 (0)	1 (1.2)
Vision (ability to see in adequate light)		
Adequate	63 (64.3)	65 (75.6)
Minimal difficulty	4 (4.1)	13 (15.1)
Moderate difficulty	5 (5.1)	6 (7.0)
Severe difficulty	1 (1.0)	1 (1.2)
Missing	25 (25.5)	1 (1.2)

fostering dependence and aligns with developing research in New Zealand [26–29]. Significantly, such exercise programmes can be successfully implemented by non-health professionals rather than physiotherapists [30]. The use of HCAs to deliver direct care is a sensible strategy to developing a sustainable workforce. Once patients have returned home, direct clinical care responsibility returns to the general practitioner (GP). The team works in close collaboration with GPs and practice nurses as well as the specialist community teams and hospital services and will continue to visit the patient until their return to independence or until stable (but requiring continuing input from community nursing or home care support). Patients are limited to 6 weeks attendance, though the team on an exception basis may choose to extend this to maximise potential recovery. Patients are supported to develop meaningful distal goals

which are re-interpreted into a therapy ladder to support development of a care-plan utilising functional rehabilitation principles.

Participants were randomly assigned to either the intervention or control group using a computer-generated randomisation sequence. Participants assigned to the control group were provided with usual care, which involved discharge planning from the hospital to their place of residence and subsequent community-based services as required. It was not possible to conceal randomisation allocation from participants but primary endpoints were collected through routine hospital datasets and analyses were undertaken blinded to the intervention/control allocation.

All enroled older people were under the care of their GP and the health services being evaluated. Adverse Events and Serious Adverse Events were monitored according to the International Conference on Harmonisation/Good Clinical Practice standards. At each data collection point, the research associate collected additional data around GP visits, hospitalisations, falls, reported episodes of abuse, infections, which was independently reviewed 3-monthly by a monitoring committee.

A total sample size of 176 participants was estimated to provide a power of 90% with a 2-sided $\alpha = 0.05$ to detect a 20% reduction in mean hospital length of stay (index hospital admission) from 15 to 12 days (a difference of 3 days) assuming a SD of 6.1. The changes were based on previous findings of studies exploring the impact of SDTs on hospital length-of-stay [12] and local clinical experience during delivery of a prototype service.

Summaries of collected data are presented in Tables 1–3 as counts and percentages for categorical and means and standard deviations for continuous. All statistical tests were 2-tailed and a 5% significance level maintained throughout the analyses. All treatment evaluations were performed on the principle of ‘Intention to Treat’ and analyses were blinded. Analysis of variance, adjusted by age was undertaken on the primary end-point. Secondary outcomes were analysed using analysis of variance (adjusted by age) for readmission data and costs. Changes in functional status was assessed through the *interRAI-CA*, analysed using 2×2 chi squared, as presentation of the individual items of the ADL and IADL scales were considered of more value than summative scores. All analyses were performed using SAS Software 9.4.

Results

In total, 351 older people were screened and 184 participants entered the trial (recruitment rate 52.4%) (see Appendix 1, in Supplementary Information for Consort Flow Diagram). One participant withdrew after randomisation before the baseline assessment. Participants were mostly female, of European descent, lived in their own home either alone or with a spouse and around 15% had some level of cognitive impairment. Baseline characteristics were similar across the two groups (Table 1). Over the trial time-period,

8,700 older people were discharged across the 600-bedded tertiary hospital, which includes 81 Assessment, Treatment and Rehabilitation beds.

The START intervention reduced the mean length of time a participant spent in hospital prior to discharge home, the index admission (15.7 days in START versus 21.6 days in usual care, Table 2a). Further, participants who received the START intervention spent less time in hospital in the 6 months following randomisation, readmissions (7.1 days in START compared to 12.5 days in usual care, Table 2b). Hospital data were collected in the 6 months pre-randomisation and was comparable between the two groups (mean 22.0 days [SD 20.6] in START versus mean 22.2 [SD 20.1] in usual care).

The effect size was calculated using Partial Eta, revealing a small to moderate change for the primary outcome, the index admission (Table 2a, 0.03) and a larger change for the 6-month post-randomisation period (Table 2b, 0.06).

In-patient hospital costs were NZ\$680 per day and were the main contributor to overall costs. The START intervention was priced at NZ\$94 a day, which totalled a mean NZ \$1,618 per total episode (see Appendix 2, in Supplementary Information for detailed breakdown of START staffing inputs, by episode of care). In the 6 months prior to randomisation, participants in the START group accrued mean healthcare costs of NZ\$22,766 (SD NZ\$16,605) compared to NZ\$23,692 (SD NZ\$24,961) in usual care. Healthcare costs reduced in both groups in the 6-month post-randomisation period, though the reduction in the START group was greater ($P = 0.004$). The START group costs were calculated at mean NZ\$10,836 (SD NZ\$12,087), compared to mean NZ\$16,943 (SD NZ \$22,303) in usual care.

Functional status at baseline/follow-up is described in Table 3. Many required support for bathing and lower body dressing (around 40%). Half required assistance with meal preparation and half were unable to negotiate stairs independently. Only 20% were able to perform their own housework. There was a trend for increasing independence across the functional domains for those participants who had received the START intervention. The *interRAI-CA*

does not readily lend itself to statistical interpretation and therefore the independent value was redefined as '1' from '0' and dependent as '2' from '1' and the mean differences from baseline to follow-up were analysed.

Discussion

The START service reduced both the index hospital admission and time in hospital in the following 6 months. Understanding the mechanism by which this was achieved requires a pragmatic interpretation. START, like any successful SDT does not operate a waiting list, can deliver intensive home-based support immediately and has the trust and confidence of the in-patient clinical teams. As such, even very frail older people can be discharged home at any point rather than waiting sometimes several days for a similarly intensive home care package to be established.

There are several ways to interpret the reduction in hospital admissions within the START group in the 6 months post-randomisation. The reduction in the time an individual spent in hospital reduced hospital exposure [1, 2, 4], which in the process may have contributed directly to reduced readmission rates. Further, the enhanced oversight from an experienced inter-disciplinary clinical team within START coupled to a strong focus on individualised goals and rehabilitation and the development of a partnership approach between the patient's GP and specialist geriatric services may also have had a role.

The trend for improvements in functional status were primarily within personal ADL, specifically bathing, lower body dressing and toileting. It is possible that such activities were a focus of the service as dependency in these areas invariably require ongoing community support. Lower levels of change were observed in other domains, but this may have been more due to the ceiling effect of the assessment tool or simply that a greater number of older people were independent in those areas on discharge from hospital.

Although findings were positive around the costs of the intervention, most savings were made through reducing hospital bed-days. Given that hospital beds are seldom closed because of initiatives such as these, it is debateable as to whether financial savings were truly made, rather financial gains may come later through either delaying or preventing new hospital beds coming online. In this way, SDTs such as START offer a proven community-based secondary care tool to manage hospital capacity.

A limitation of the study, arising in the main as a direct effect of the intention to intervene on the basis of function is that no restrictions were placed on diagnoses, opting

Table 2a. Index hospital length of stay (primary outcome)

Allocation	N	Mean hospital days (SD)	Mean days difference between groups (CI)	Significance (ANOVA)	Effect size, Partial Eta (CI)
START	97	15.7 (11.5)	5.9 (0.6, 11.3)	0.030	0.03 (0.0, 0.08)
Usual care	86	21.6 (22.9)			

Table 2b. Time in hospital in the 6-month period post-randomisation (readmissions)

Allocation	Mean hospital days over 6 months (SD)	Mean discrete hospital episodes (SD)	Difference between groups for mean hospital days (CI)	Significance (ANOVA)	Effect size, Partial Eta (CI)
START	7.1 (12.8)	1.3 (1.1)	5.4 (-0.2, 11.3)	0.047	0.06 (0.0, 0.1)
Usual care	12.5 (24.2)	1.7 (2.4)			

Table 3. Function at baseline and follow up

Measure	START		Usual care		P value (mean diff. on scores)
	Baseline, N (%)	Follow up, N (%)	Baseline, N (%)	Follow up, N (%)	
Bathing (ADL self performance)					
Independent or set-up help only	34 (34.7)	63 (65.6)	38 (44.2)	48 (55.8)	0.006
Supervision or any physical assistance	63 (64.3)	18 (18.8)	48 (55.8)	28 (32.6)	
Missing	1 (1.0)	15 (15.6)	0 (0)	10 (11.6)	
Mean scores	1.65	1.22	1.56	1.37	
Personal hygiene (ADL self performance)					
Independent or set-up help only	79 (80.6)	75 (78.1)	67 (77.9)	64 (74.4)	0.400
Supervision or any physical assistance	19 (19.4)	6 (6.3)	19 (22.1)	12 (14.0)	
Missing	0 (0)	15 (15.6)	0 (0)	10 (11.6)	
Mean scores	1.19	1.07	1.22	1.16	
Dressing lower body (ADL self performance)					
Independent or set-up help only	59 (60.2)	71 (74.0)	58 (67.4)	59 (68.6)	0.025
Supervision or any physical assistance	38 (38.8)	10 (10.4)	28 (32.6)	17 (19.8)	
Missing	1 (1.0)	15 (15.6)	0 (0)	10 (11.6)	
Mean scores	1.39	1.12	1.33	1.22	
Locomotion (ADL self performance)					
Independent or set-up help only	81 (82.7)	76 (79.2)	69 (80.2)	65 (75.6)	0.327
Supervision or any physical assistance	16 (16.3)	5 (5.2)	17 (19.8)	11 (12.8)	
Missing	1 (1.0)	15 (15.6)	0 (0)	10 (11.6)	
Mean scores	1.16	1.06	1.20	1.14	
Toilet use (ADL self performance)					
Independent or set-up help only	57 (58.2)	74 (77.1)	71 (82.6)	67 (77.9)	0.545
Supervision or any physical assistance	15 (15.3)	7 (7.3)	14 (16.3)	9 (10.5)	
Missing	26 (26.5)	15 (15.6)	1 (1.2)	10 (11.6)	
Mean scores	1.21	1.09	1.16	1.12	
Meal preparation (IADL capacity)					
Independent or set-up help only	43 (43.9)	61 (63.5)	39 (45.4)	51 (59.3)	0.415
Supervision or any assistance during task	54 (55.1)	20 (20.8)	46 (53.5)	25 (29.1)	
Missing	1 (1.0)	15 (15.6)	0 (0)	10 (11.6)	
Mean scores	1.56	1.25	1.54	1.33	
Ordinary housework (dishes dusting etc.) (IADL capacity)					
Independent or set-up help only	10 (10.2)	35 (36.5)	18 (20.9)	35 (40.7)	0.267
Supervision or any assistance during task	87 (88.8)	46 (47.9)	68 (79.1)	41 (47.7)	
Missing	1 (1.0)	15 (15.6)	0 (0)	10 (11.6)	
Mean scores	1.90	1.57	1.79	1.54	
Managing medications (IADL capacity)					
Independent or set-up help only	65 (66.3)	64 (66.7)	55 (64.0)	59 (68.6)	0.725
Supervision or any assistance during task	33 (33.7)	17 (17.7)	30 (34.9)	17 (19.8)	
Missing	0 (0)	15 (15.6)	1 (1.2)	10 (11.6)	
Mean scores	1.34	1.21	1.35	1.22	
Stairs (IADL capacity)					
Independent or set-up help only	26 (26.5)	54 (56.3)	35 (40.7)	53 (61.6)	0.137
Supervision or any assistance during task	72 (73.5)	27 (28.1)	49 (57.0)	23 (26.7)	
Missing	0 (0)	15 (15.6)	2 (2.3)	10 (11.6)	
Mean scores	1.73	1.33	1.58	1.30	

more to focus on a population of older people who had experienced a recent decline in function, often had low morale with a level of cognitive impairment. Such inclusion criteria are common to the original SDT, still operating in Lambeth, London [12]. Conclusions from this study therefore need to be cognisant of the inclusion criteria described herein. We believe our findings can be generalised, where the same eligibility criteria apply. However, the application of the inclusion criteria could have a substantial impact on extrapolation of results to other services.

Key points

- Supported Discharge Teams can support older people with a variety of conditions to be discharged earlier from hospital.
- Supported Discharge Teams can reduce risk of readmission to hospital for older people.
- Supported Discharge Teams have an important role to play in increasing bed capacity of hospitals.

Supplementary Data

Supplementary data mentioned in the text are available to subscribers in *Age and Ageing* online.

Acknowledgements

A huge thanks to Barb Garbutt, General Manager of Older Person Rehabilitation Services, Waikato District Health Board, without who's wisdom and support, fundamentally important pieces of the evidence puzzle could not have been solved. To Raewyn Dean, the forever flexible, dynamic service leader who has created a wonderful team—well done!

Funding

The research was funded by the Health Research Council of New Zealand (ref. 11/720).

Conflicts of Interest

None.

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Received 26 March 2017; editorial decision 11 October 2017